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MARC DATA COLLECTION – A FLAWED PROCESS

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USAWC STRATEGY RESEARCH PROJECT

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ABSTRACT

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The purpose of this paper is to provide evidence that the Army has not correctly resized the aviation maintenance structure to support transformed aviation units; that the process used to determine current personnel requirements based upon Manpower Requirements Criteria (MARC) data is flawed; and that base line MARC data needs to be revised to correctly reflect the man-power required to properly maintain the OPTEMPO of today's combat aviation brigade. This paper will demonstrate how the methodology used to develop the logic to support this conclusion was based on background issues that lead to increased usage of contract maintenance personnel. That analysis will be followed by a discussion of the MARC process; to include what the process is and how it was developed, examples of the disparities of its usage, and recommendations to improve the MARC data collection process. Finally, the paper will discuss the issues relating to the cost effectiveness of soldier maintainers versus the use of contract maintainers.

MARC DATA COLLECTION – A FLAWED PROCESS

> The Army is pursuing the most comprehensive transformation of its forces since World War II. This transformation process will produce evolutionary and revolutionary changes intended to improve Army and Joint Force capabilities and meet current and future full-spectrum requirements. Army Aviation transformation and modernization is taking place through doctrinal, training, force structure and material changes. The endstate of this transformation will be an aviation force structure that is a modular, campaign-quality maneuver arm that is optimized to provide relevant and ready capabilities to the Combatant Commander and the Joint Force Commander through the application of Combat Aviation Brigades that are agile, flexible, deployable, and sustainable.[1]

Today in Iraq, the U. S. Army has 542 rotary wing aircraft supporting combat operations.[2] These 542 aircraft equate to four and one half Combat Aviation Brigades (CAB). When these brigades deploy to theater, they are manned at 95 to 100% of their current authorization. To ensure the deployed CABs are able to support the combatant commander's aviation Operational Tempo (OPTEMPO) requirements, however, the Army is forced to augment the CAB's organic maintenance structure with 721 contracted aviation mechanics.[3] This represents a 1.3 contract maintainer to aircraft ratio. These 721 contracted aviation mechanics equate to an additional 160 aircraft maintainers per brigade, above the current aviation brigade maintenance structure. Following five years of combat, in both Afghanistan and Iraq, the aircraft Operational Readiness (OR) rate has been approximately 80%.[4] The aviation brigades have only been able to maintain this OR rate with the additional maintenance man-power of the contract maintainers. The dependency on contract maintainers to keep pace with combat operations is evidence that the methodology used to determine the minimum mission essential wartime man-power requirements is flawed and that the Army aviation organic maintenance structure is significantly under resourced.[5]

The purpose of this paper is to provide evidence that the Army has not correctly resized the aviation maintenance structure to support transformed aviation units; that the process used to determine current personnel requirements based upon Manpower Requirements Criteria (MARC) data is flawed; and that base line MARC data needs to be revised to correctly reflect the man-power required to properly maintain the OPTEMPO of today's combat aviation brigade. This paper will demonstrate how the methodology used to develop the logic to support this conclusion was based on background issues that lead to the increased usage of contract maintenance personnel. That analysis will be followed by a discussion of the MARC process; to include what the process is and how it was developed, examples of the disparities of its usage, and recommendations to improve the MARC data collection process. Finally, the paper will discuss the issues relating to the cost effectiveness of soldier maintainers versus the use of contract maintainers.

Background

In December 2000, as part of Army Transformation directed by GEN Eric K. Shinseki, Chief of Staff of the Army (CSA), Army Aviation became a target for reduction and reallocation of fiscal and personnel assets. The CSA considered the Army's current aviation structure too costly with respect to maintaining the readiness of its aging fleets, and unable to deploy rapidly. The CSA also believed the reserve component's aviation assets were deficient due to unsatisfactory readiness rates, and they lacked modern aircraft which impacted their ability to conduct training.[6] Based on these views, he directed the Vice Chief of Staff of the Army (VCSA) to establish an Army Aviation Transformation Task Force. This Task Force was chartered to examine the aviation force structure and develop force structure changes. Specifically, the Task Force was to consider capitalizing on new and emerging technologies that would increase mobility and sustainability, while significantly reducing both the logistical support requirements and footprint.[7]

Before September 2001, the Army maintained nine different mission design series (MDS) aircraft in the active and reserve components. U.S. Army Special Operations Command maintained its own series of aircraft, and these aircraft will not be discussed in this paper. The MDS aircraft fell into two categories. The first category, consisting of the AH-1, the UH-1, the OH-58A/C, and the OH-58D, contained the legacy or non-modernized aircraft. The second category of aircraft included the AH-64A, the AH-64D Longbow, the UH-60A, the UH-60L, and the CH-47D which were considered modernized or objective aircraft. Each MDS aircraft required specific training programs for both flight and maintenance personnel. Further, each aircraft required a unique logistical support infrastructure. These unique legacy fleet requirements consumed vast resources, procuring repair parts that were no longer being manufactured. Costly contracts were initiated to restart production lines. Additionally, Flight Safety monitoring and re-engineering efforts consumed excessive engineering man-hours as major structural airframe components experienced stress cracking or mechanical components exceeded the prescribed service life.[8]

To stem further loss of resources to the legacy fleets, GEN Shinseki directed the divestiture of these aircraft, allowing the Army to focus scarce resources on procurement programs and re-capitalization efforts. He directed the following divestitures: the AH-1 by the end of FY2001, the UH-1 no later than the end of FY2004, the OH-58A/C no later than the end of FY2006, and the OH-58D no later than the end of FY2011.[9]

In December 2000, the Army Staff convened the Aviation Transformation Task Force, which was required to develop and present a detailed aviation transformation implementation plan to the CSA.[10] Representatives from each staff component, each Army Command, the National Guard Bureau, and the United States Army Reserve participated in the joint effort to modernize and transition the aviation force to support the Objective Force. These representatives were given guidance from the CSA to maintain the ability to fight and win decisively in the near term. Additionally, it was established that transformation efforts must set the conditions for long-term transformation as well as providing the means to accelerate modernization across the Active and Reserve Components. TRADOC began the initial capabilities studies to determine recommendations for the ideal combat aviation structure.

As a result of their arduous labor, the Task Force developed a force structure concept. TRADOC briefed this concept to the CSA in February 2001 after which the Aviation Task Force reconvened in March 2001 to further develop and determine the cost of the new force structure concept.[11] Following the Aviation Transformation Task Force outbrief in August 2001, the CSA stated that the proposed force structure did not support his operational vision and that the required increases were unaffordable. On 5 September 2001, the CSA sent a memorandum to the VCSA outlining his directed aviation force structure. This structure, which consisted of a significant reduction in both aircraft and personnel across both corps and divisional units, was not based on the force capability study conducted by TRADOC. It was based on what the CSA believed affordable.[12] He stated in an October 2000, Association of the United States Army Green Book article, “We are attempting to transform ourselves during an unprecedented period—a time of relative peace, of unrivaled economic prosperity and of stampeding technological progress. The conditions are most favorable for our success, but the window of opportunity may have already begun to close.”[13] The terrorist attacks carried out on September 11, 2001 closed this window. Units that were transforming per GEN Shinseki’s vision were forced to prepare to deploy to Afghanistan.

As the Army Staff worked fervently to develop new unit authorization documents, a significant problem quickly became apparent. The Army had no current Manpower Requirements Criteria (MARC) Maintenance Data Base to use to determine the maintenance personnel requirements for the new transformation structure. The available MARC data was developed to support the legacy fleets.[14] As transformed units deployed in support of OEF, it became clear the Army had seriously under-resourced the aviation maintenance structure for these units. Due to split based operations throughout Afghanistan, there were not enough maintenance personnel, special tools, and repair parts to sustain the transformed aviation units. Therefore, the Army was forced to supplement organic aviation assets with civilian aviation maintenance contractors to support operations in Theater.

It seems this series of events culminated in the breakdown of accurate information. This breakdown led to incorrectly manning the Army’s aviation maintenance structure. Further compounding the lack of MARC data is the fact that much of the data required for the MARC Maintenance Data Base process was flawed. This leads to the discovery a broken system.

MARC Defined

MARC is a Department of the Army program that establishes the manpower criteria or standards used to determine minimum mission essential wartime requirements (MMEWR) to perform combat support (CS) and combat service support (CSS) functions (both maintenance and non-maintenance) for sustained combat operations. MARC is primarily used to document the CS/CSS positions in tables of organization and equipment (TOEs).[15] The Army G-3 is responsible for the MARC Program.[16] U.S. Army Force Management Support Agency (USAFMSA) is the G3 executive agent for MARC and is responsible for insuring that the MARC is continually refined to support force modernization.[17]

This process, used by the Army to determine the number of maintenance personnel required to support fielded systems (for example an AH-64D), is built around the Army MARC Maintenance Data Base. This database contains the direct productive annual maintenance man-hours (DPAMMH) required for each Military Occupational Specialty (MOS) supporting a given fielded system in wartime. The associated indirect workload not specifically attributable to each fielded system is added to the DPAMMH to produce the annual maintenance man-hours (AMMH) component of the MARC formula (Figure 1). The density of this fielded system in a specific unit is then multiplied by the AMMH and divided by the Annual MOS Availability Factor (AMAF). The resulting number of maintenance personnel is rounded to provide the required number of maintainers for documentation in the Tables of Organization and Equipment (TOEs).[18]

$$\frac{\text{Density of equipment multiplied by annual maintenance man-hours}}{\text{Annual military occupational specialty availability factor}} = \text{Personnel requirements}$$

Figure 1.

The argument developed in this paper contends that the data contained in the MARC Maintenance Data Base is inaccurate and the collection sources do not provide reliable or realistic information. This deficiency became more obvious during an Aviation Maintenance MARC teleconference hosted by USAFMSA in November of 2006. The Apache Program Manager's (PM) Logistics Management Division briefed the results of an Apache Longbow (AH-64D) MARC DPAMMH Study.[19] The study concluded that attack helicopter battalions and AH-64D unit level and intermediate level maintenance companies should be reduced by 13 maintainers.[20] With operations in Iraq requiring a 1.3 contractor to aircraft ratio above the documented numbers of soldier maintainers to support mission requirements, the Apache PM's recommendation to reduce the organic aviation maintenance structure intuitively appeared flawed.

<u>Evidence of a Flawed Process</u>

In a March 2000 Army Audit Agency (AAA) Report, auditors determined:

> …the Army's process to develop direct maintenance man-hours was not effective. The Army's life-cycle management community (U.S. Army Materiel Command and Program Executive Offices) is generally responsible for developing direct maintenance man-hours. [The Auditors] sampled 196 items (equipment) and found that at least 173 of the items had no supporting documentation to show how the associated direct maintenance man-hours were developed.[21]

Additionally, auditors determined that if data did exist, the material developer had used surrogate man-hours or maintenance man-hours from previous or like-item equipment. However, no one could provide the documentation or analysis validating that the man-hours requirements had not changed from the earlier equipment. The report stated that using similar maintenance man-hours for different systems due to equipment similarities was not an acceptable practice unless documentation validated that the current equipment maintenance requirements matched that of the previous or like-item equipment.[22]

Proposed Solution to the Army Audit Agency Report

To address the findings of the AAA Audit, the Army Materiel Systems Analysis Activity (AMSAA) developed a standard MARC methodology that incorporated the use of field data to verify and update direct productive annual maintenance man-hours (Figure 2). AMSAA attempted to collect system level usage, coupled with MOS task level maintenance man-hours, to derive the DPAMMH[23]. This paper outlines the planned data collection methods and the inaccuracies associated with each data source.

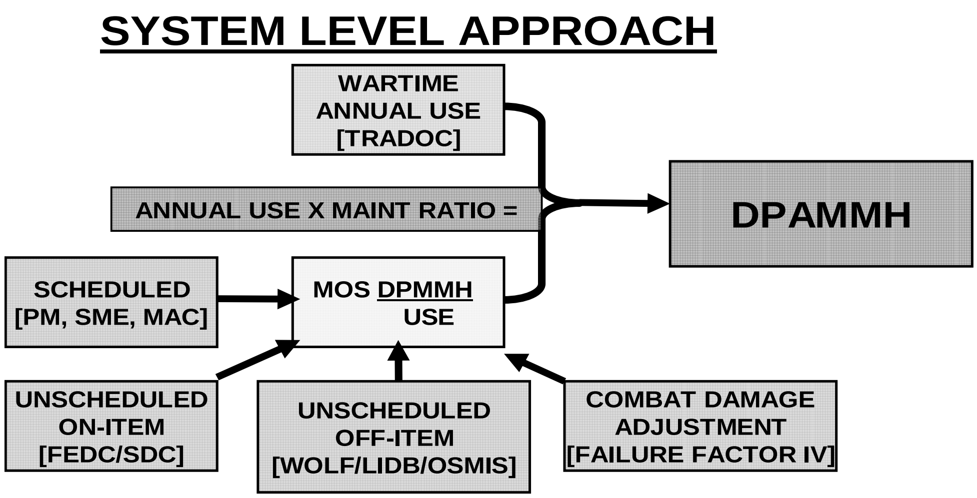

Figure 2.

AMSAA collects unscheduled maintenance data from current Standard Army Management Information Systems (STAMIS) such as Unit Level Logistics System–Ground (ULLS-G), Unit Level Logistic System–Aviation (Enhanced) (ULLS-A(E)), and Standard Army Maintenance System (SAMS). These are the computer based software systems used by operators and field level maintenance personnel to track Preventive Maintenance Checks and Services (PMCS), to determine the Prescribed Load List (PLL) usage by a unit, and to obtain information about other maintenance management functions.[24]

Unintentional Corruption of the Data Base

As it was designed, the MARC Data Base fails to take into account any inaccuracies that result from the human component. There are no fail safes built into the system to highlight data that inadvertently is entered incorrectly. The following hypothetical examples illustrate how MARC data can be corrupted when man-hour accountability is lost and maintenance performed is not properly accounted for.

In one scenario, an AH-64 mechanic (MOS 15R) prepares an aircraft for a mission. While performing his PMCS, he discovers that the tailrotor gearbox chip detector is leaking. Being the motivated soldier that he is, he references the manual, looks up the part number for a new O-ring to repair the fault, enters the request into the ULLS-A(E) logbook, goes to his Production Control Non-Commissioned Officer in Charge (NCOIC) to expedite his request, and proceeds to Tech Supply to pick up the part. The mechanic then returns to the aircraft, removes the chip detector, replaces the O-ring, and reinstalls the chip detector. He then makes the appropriate entries in his logbook, locates his maintenance supervisor to inspect his work and the supervisor signs the work off in the logbook as completed. For AMSAA to get the unscheduled maintenance data, our mechanic must enter the time it took him to complete the repair in the ULLS-A(E) logbook. From fault identification to completion of the inspection by the maintenance supervisor, the repair took one hour and twenty minutes. However, from the perspective of the mechanic, the task required only twenty-five minutes for him to physically replace the O-ring on the chip detector. He enters .4 hours in the required data field for the twenty minutes it took. The Army therefore loses accountability for one hour of this Soldier's valuable time to allocate to direct productive time.

The loss of proper time allocation occurred because the mechanic did not consider the time required to look up the part number, order the part through the ULLS-A(E) logbook, and go to supply to pick up the part. He only accounted for the time that it took him to remove the chip detector, install the new O-ring, reinstall the chip detector, and have his supervisor inspect his work. Human error entered the data collection formula, invalidating it and rendering the data unreliable.

In another typical scenario, a maintenance sergeant checked his eight aircraft following physical training and noticed that three of the aircraft appeared to have low air pressure in their main landing gear tires. He instructed two mechanics to go to the tool room, sign out the nitrogen cart, and check the tire pressure on each of the eight aircraft. The Soldiers executed their task in one hour, and in the process serviced 24 tires. However, none of the ULLS-A(E) logbooks for the aircraft that required the tire service were updated by the mechanics. The mechanics failed to make entries in the aircraft logbooks because this was such a minor task and did not require an inspection upon completion. Again, the Army would lose credit for two hours of direct production man-hours and the credit for completing a servicing task eight times on the aircraft.

Scenarios similar to these occur much too often in our maintenance companies. Although Army Soldiers are extremely busy, it is imperative that they receive proper training and supervision to ensure accurate reporting of their maintenance productivity.

Both maintainer and supervisor must understand the significance of accounting for their time as it relates to the development of current manning documents. Understandably, soldiers are primarily focused on getting the job done. As stated in the Soldiers Creed, “I will always place the mission first”.[25] They are mission focused, as they should be; not focused on accounting for every minute of their time. In combat, the maintainers' mission is ensuring readiness. When constrained by time, Soldiers will correctly prioritize maintenance functions over non-mission essential man-hour collection tasks.

Lost Accountability of Man-Hours

Another suspect automated data source that AMSAA is using to collect unscheduled maintenance man-hours is the Work Order Logistics File, more commonly known as the WOLF.[26] Maintenance support activities produce a monthly report through their Standard Army Maintenance System (SAMS), which is an automated logistics and integration system that provides logistics personnel a management tool to assess weapon system readiness status, maintenance, and repair parts information, and facilitate associated management functions.[27] This report includes a synopsis of completed work orders or jobs, and the man-hours expended on each by the maintenance support activity. The maintenance activity or unit transmits the report to the Army Materiel Command's Logistics Support Activity (LOGSA), where the WOLF is populated and maintained.

Questions have arisen regarding the accuracy of this data source. In an interview with CW5 Bob Morrill, an Aviation Material Manager in FORSCOM G4, he stated that only four percent of FORSCOM aviation units submitted their data to AMSAA in FY07 for inclusion in the WOLF report.[28] He further determined that many units would open one work order, order parts against that work order, and repair numerous components. While this practice greatly reduces the clerical workload for the shop section, it masks the volume of work that the shop section performs as well as which MOSs are heavily engaged in maintenance operations.

Another alarming discovery involved the loss of an entire year's worth of critical combat maintenance data. On an assistance visit to a Combat Aviation Brigade (CAB) of a deployed division, CW5 Morrill met with the unit's SAMS clerk to discuss the clerk's daily operations and the procedures he used to collect the supported units' work order data. Data Collection using the automated systems posed a significant concern within the footprint of the CAB, since they were assigned to several forward operating bases throughout the division's area of operations. CW5 Morrill questioned the clerk about the weekly close out procedure; specifically, to whom and by what method he sent the weekly maintenance reports to ensure that LOGSA received the information. Astonishingly, the clerk replied that he did not send a report to LOGSA. The reports were saved to a disk which was reformatted each week for the subsequent report. A lack of training and supervision allowed human error to corrupt the data feeding the WOLF. The WOLF, the repository for all closed work orders from the direct and general support maintenance units, is inaccurate and certainly unreliable.

Based on this information it becomes readily apparent that the data in the WOLF Report is unreliable for determining the Army's maintenance structure. Members of the U.S. Army Audit Agency reinforced the findings discussed in this paper following an audit on the work order logistics file in May 2003. In their audit, they determined the WOLF file did not contain accurate data.[29] In many cases, the errors can be attributed to poor training or inadequate supervision. Ultimately, a case can be made that when human error enters into the data collection process there is no system of checks and balances to ensure the data collection is done correctly. The auditors determined the WOLF Report wasn't reliable enough for Army managers to effectively use in reviewing maintenance operations or to identifying areas where improvements could be made.[30]

The Army's automation maintenance systems can provide a valuable source of data. However, the current processes resident in Army aviation systems to collect data supporting the MARC are flawed. This is evident by the recent failure to collect valid data that was intended to support the Army's Total Cost of Ownership (TCO) initiative. When leveraging automated technologies to support data collection, it is imperative that the burden of data accuracy is built into the automated collection capability, and that it does not rest with the Soldier. The TCO business processes were designed on a framework that hinged on Soldiers inputting accurate data from a series of drop down menus. This process extends the time required to complete the task because the Soldier must read through the options available to select the correct field within the drop down menu. Some Soldiers do not understand how critical it is for them to use accuracy in reporting. More importantly, aviation maintenance Soldiers currently prioritize aircraft and unit readiness and their maintenance mission over the data collection mission. This is especially evident when Soldiers encounter a heavy work load and have limited time to complete their mission. To facilitate maintenance mission accomplishment, Soldiers consistently choose the path of least resistance to complete the data entry task. In order to hurry through the tedious data entry process, Soldiers often choose the first selection in the drop down menu, which has a default value such as .1 man-hours for every maintenance event. With this data collection bias in mind, future automated processes should be built around a plan that uses a balance of assumptions, technology, defaults, policy, and training to achieve a level of accuracy that is dependable.[31]

Corrective Measures

This section will suggest possible measures that would mitigate the data collection shortfalls and accuracy issues discussed in prior sections. One recommendation is to employ a flat rate methodology for determining maintenance man hours. Another corrective measure might be to develop a system to improve the collection of sample data. AMSAA could employ teams of trained data collectors inside the MOS producing schools or in units to facilitate accurate data collection. Since alternatives to the data collection and accuracy problems exist, it is crucial that the Army adopt a solution to correct the problems so that the accurate number of aviation maintenance personnel can be determined and sourced.

Flat Rate Methodology to Determine Maintenance Man Hours

One method to alleviate the inherent inaccuracies of our automation systems is to apply a flat rate time for each maintenance task. For example, when a customer takes a vehicle to a General Motors (GM) Service Center for a water pump replacement, the time allocated to schedule the repair as well as the cost is determined on a flat rate of 2.5 hours. This alleviates the requirement for the mechanic to document every moment spent on the repair. This method is derived from an average of experience level and proficiency at task. An inexperienced mechanic may require three hours to complete the water pump replacement, while a master mechanic may complete the task in two hours. However, a well trained mechanic with moderate experience would complete the water pump replace within the 2.5 hours.[32]

The GM business methodology can and should be applied to Army aviation maintenance management applications. Flat rate times entered in the ULLS-G and ULLS-A(E) data bases for each maintenance task would significantly reduce man-hour tracking errors and ease crew chief workload. If this method was applied, the mechanic would simply enter the maintenance task in the computer, and the ULLS database would automatically populate the time data field with the flat rate time. If the task required either a significantly longer or shorter time to complete than allocated by the flat rate, an authorized correction could be made by a maintenance supervisor or technical inspector to correctly capture the maintenance effort expended and update the generic benchmark. The Army's Sample Data Collection (SDC) Program can facilitate the collection of the data needed to populate the maintenance management applications.

Improve Sample Data Collection

The SDC program, managed by AMSAA, was developed to alleviate the cumbersome requirement to report all maintenance data to the national maintenance point. Statisticians realized that a small number of units could be selected to provide data that would represent the total fleet with a high degree of confidence.[33] The sampled data could be stored, managed, and analyzed with great accuracy and at a lower cost than collecting data on all maintenance actions. The data was initially used to support studies, such as weapon systems performance, logistics supportability, reliability, availability, maintainability, aging degradation, cost, and training.[34]

The Field Exercise Data Collection (FEDC) program is included in the SDC program to provide data collected during field training exercises. With data collected from contingency operations and over 500 field training exercises[35], the SDC/FEDC data base is an exceptional source of information and should be leveraged to analyze maintenance tasks, equipment service requirements, man-hour requirements, parts usage data, and environmental parts usage planning factors. The analysis can be distributed to material managers in the Program Executive Offices, USAFMSA, and Army research and development centers to assist these agencies in determining systems support requirements.[36]

The SDC program uses four to five data collectors to observe maintenance operations within an aviation brigade while it conducts a field training exercise. The data collectors cannot personally observe all maintenance operations. Therefore, the majority of the data is collected using manual and automated STAMIS systems such as Department of the Army Forms 2064 (Document Register for Supply Actions), 2404 (Equipment Inspection and Maintenance Worksheet), and 2407 (Maintenance Request).[37] Scrutiny must be applied to the data collected by the SDC program, because this is not fault-free data. As noted throughout this paper, the STAMIS systems will consistently contain a certain amount of invalid data. It is important for AMSSA to develop a more accurate system that accounts for human error and automatically adjusts certain values to reestablish the baseline for increased accuracy in developing the maintenance man-hour requirements.

The premier data source for establishing a baseline for maintenance man-hours required to support aviation equipment should come from units in Iraq or Afghanistan.

Stationing data collectors within combat units in Theater would produce the best data collection result. However, the Aviation Readiness Division of the Army G4 and aviation readiness teams from USAFMSA, CASCOM, and AMSAA (members of the Aviation MARC Study Task Force) determined that it would require, at a minimum, eighteen to twenty data collectors to observe one attack battalion performing 24-hour operations.[38] This large number of collectors, required to observe and capture all maintenance functions, would overwhelm and over burden the target unit, based on their logistical support requirements. Establishing accommodations for billeting, mess, and force protection are among the many logistical requirements to incorporate the data collectors into the units.

One possible solution for this problem would be for AMSAA to establish a data collection site at each of the MOS producing schools. Currently, data collectors are subjected to mortar attacks and suicide bombers as they move back and forth between the forward operating bases in Iraq in their attempt to monitor the maintenance operations of combat units. A better solution would be to position the data collectors at the MOS producing schools. The data collectors would be able to collocate with the maintenance parts task trainers and observe students executing each task that is required to maintain a fielded system. In the course of an Advanced Individual Training (AIT) program, hundreds of students perform each maintenance task. The schools offer a sterile environment that can establish a baseline for each required task. Skill levels, ranging from exceptional to poor, would provide a solid average to build a flat rate maintenance man-hour per task baseline to populate the ULLS data base. Over the span of ten AIT classes, the extensive repetitions per task would validate the flat rate maintenance Man-hour allotted to the task. Combat experienced instructors examine the data collected to ensure that the times recorded are accurate based upon the instructors' field experience. Additionally, data collection within the school environment is much safer for the data collector, and more cost effective than gathering the required information in a combat environment.

OPTEMPO Influence on Contractor Dependency

The Army aviation maintenance structure is currently based on a system that is developed from a flawed data collection process. This has resulted in the aviation maintenance units functioning with incorrect man-power levels. Once the data collection process is corrected, the Army's challenge is to determine if it is more cost effective to increase the number of Soldiers to perform maintenance tasks, or to continue funding contract maintenance personnel to augment the current aviation maintenance structure to meet mission requirements. The answer to this question can be determined by examining the operational demands placed on military forces today. Since the end of the Cold War, the U.S. military has been reduced by approximately 35 percent.[39] Based on the reductions in the military force structure, senior leaders forecasted significant reductions in maintenance support operations, determining that they would temporarily augment with contract maintenance support in time of surge requirements rather than resource the total cost of a Soldier and related infrastructure.[40] However, Operations Desert Shield, Desert Storm, Bosnia, Kosovo, Kuwait, OEF and OIF indicate that Army Aviation's OPTEMPO in the post cold war era has significantly increased.

In order to meet increasing demands and to help reduce stress on the force, the Army will increase its end strength by 65,000, the majority of which will be used to complete the manning of the 48 Brigade Combat Teams (BCT).[41] In determining the cost of the additional end strength, the Army G1 in 2007 forecasted that the cost of a soldier is $119,136 per year.[42] This expense includes costs ranging from recruiting, training, billeting, medical, installation support, and retirement.[43] Comparatively, a contractor in Iraq that supplements the Army aviation organic maintenance structure costs $279,552 per year. This figure is based on the average contractor working an 84 hour work week, receiving $64 per hour, for 52 weeks.[44] This figure does not include the overhead cost paid directly to the company providing the contract maintainer.

This substantial disparity in pay leads to significant Soldier retention issues as well as creating a drain on the Army's future enlisted leaders.[45] The contractor leadership is constantly recruiting the most talented and motivated Soldiers in direct competition with the Army retention programs.[46] The Army cannot compete with the lucrative job offers made by its corporate competitors. Unfortunately, the majority of the Army's best and brightest are often lured away by these corporate contracting competitors.[47] This leaves the Army's aviation maintenance force to be manned by those who are lacking in marketable experience. These issues predate the increased pressures placed on the force since 2001. During the 1998 confirmation hearings of the Assistant Secretary of the Army for Manpower and Reserve Affairs, Patrick T. Henry stated,

> I view recruiting and retaining the right men and women as a major challenge in the Army's drive to maintain readiness. While the Army continues to attract and retain high-quality recruits, enticing the necessary number of talented young people, especially high school graduates in the highest three categories of mental aptitude, is becoming increasingly difficult in the face of a strong economy and the absence of a tangible

> national threat. Similarly, retaining the right caliber of soldier in the appropriate grades and skills is becoming increasingly difficult due, in part, to the increased frequency of deployments and perceived availability of private-sector opportunities.[48]

Currently, the need to retain high caliber Soldiers is more critical than ever due to the increased personnel tempo and repetitive combat tours during this period of protracted war in Iraq and Afghanistan.[49]

Conclusion

The Army has yet to correctly establish the aviation maintenance man-power requirements. To correct the deficiencies the Army must implement actions to correct or compensate for errors in the data collections process. Ultimately, the MARC formula must be determined by using correct data. A more in-depth study is required to determine how to better collect the data that populates the MARC data base. Then, as the Army increases its end strength by an additional 65,000 soldiers, the Army's senior leadership must determine whether to allocate certain amounts of this man power increase into the maintenance arena or to continue using contract maintenance personnel.

Endnotes

[1] U.S. Office of Management and Budget, "Detailed Information on the Army Air Readiness Assessment: Program Improvement Plans 2003," linked from the *Expect More Home Page*, available from http://www.whitehouse.gov/omb/expectmore/detail/10003229.2006.html; Internet; accessed 21 January 2008

[2] *Operation Iraqi Freedom/Operation Enduring Freedom Operational Tempo,* PowerPoint Charts (Redstone Arsenal, Huntsville, AL: Program Executive Office – Aviation, December 2007). Maintained by Mr. Jerry Cox. Hereafter cited as *OIF/OEF OPTEMPO* Charts.

[3] CW3 William T. Coleman, MNC-I C4, MRD (AMO/LOG Planner), L3 Maintenance Contract PO/ACOR, telephone and email interview by author, 30 December 2007.

[4] *OIF/OEF OPTEMPO* Charts.

[5] Coleman.

[6] *Aviation Transformation Outbrief to the CSA*, Briefing Charts, 6 December 2001. Briefing presented to GEN Shinseki by the Aviation Transformation Task Force Chair, which outline the Task Force's proposed force structure. Maintained in the Aviation Directorate, Army G3/5/7, Pentagon, Washington, D.C..

[7] U.S. Department of the Army, "Executive Summary" in *U.S. Army Posture Statement 2001* (Washington, D.C.: U.S. Department of the Army, 2001); available from http://www.army.mil/APS/aps_es.htm; Internet; accessed 18 February 2008.

[8], "Army Accelerates Aviation Transformation," 7 September 2001, available from http://www4.army.mil/OCPA/read.php?story_id_key=1425; Internet; accessed 18 February 2008.

[9] Ibid.

[10] *Aviation Transformation Outbrief to the CSA*, Briefing Charts Briefing Charts.

[11] Ibid., slide 6.

[12] Eric K. Shinseki Papers, "*Aviation Modernization Plan*," memorandum for the Army Vice Chief of Staff, Washington, D.C., 5 September 2001. This memorandum can be found at Army Heritage Education Center using the following citation: Official Correspondence, Army Chief of Staff, Incoming and Outgoing, 1 September 2001 through 5 September 2001, Box 30, 1-30 September 2001, Series 1, Official Correspondence, Army Chief of Staff, Eric K. Shinseki Papers, U.S. Army Military Institute, Carlisle Barracks, PA.

[13] Eric K. Shinseki, "The Army Transformation: A Historic Opportunity," *Army Magazine* (October 2000): 21. Association of the United States Army Green Book.

[14] U.S. Army Audit Agency, *Manpower Requirements Criteria – Maintenance and Support Personnel*, Audit Report AA 00-147 (Washington, D.C.: U.S. Army Audit Agency, 22 March 2000), 25.

[15] U.S. Army Force Management Support Agency, *Manpower Requirements Criteria (Marc) "How To" Procedures Guide* (Fort Belvoir, VA: U.S. Army Force Management Support Agency, 1 October 2005), 1 ; available from https://www.usafmsa.army.mil/unprotected/ Ref_Docs/marchowto/table_of_contents.html; Internet; accessed 12 December 2007.

[16] U.S. Department of the Army, *Force Development and Documentation— Consolidated Policies*, Army Regulation 71–32 (Washington, D.C.: U.S. Department of the Army, 3 March 1997), 3.

[17] Ibid., 3.

[18] U.S. Army Materiel Systems Analysis Activity, *AMSAA Methodology for Direct Productive Annual Maintenance Man-Hours*, Technical Report NO. TR-715 (Aberdeen, MD, U.S. Army Materiel Systems Analysis Activity, January 2003), 1, 1-1.

[19] Logistics Management Division PM – Apache, “Maintenance Manpower Requirement Criteria (MARC) Direct Productive Annual Maintenance Man-Hour (DPAMMH),” briefing, Pentagon, Washington, D.C., 27 November 2006. Derived from the Apache Longbow DPAMMH Study.

[20] Ibid., 7.

[21] U.S. Army Audit Agency, *Manpower Requirements Criteria – Maintenance and Support Personnel,* 11.

[22] Ibid., 15.

[23] U.S. Department of the Army, *Sample Data Collection*, Army Pamphlet 700–24 (Washington, D.C.: U.S. Department of the Army, 30 January 2007), 6.

[24] Information Briefing,” linked from the *ULLS-A(E) Home Page*, available from http://www.cascom.lee.army.mil/esd/systems/ulls/ ullsindex.htm, Internet; accessed 5 January 2008.

[25] “The Soldier’s Creed,” available from http://www.army.mil/SoldiersCreed/ flash_version/index.html; Internet; accessed 6 January 2008.

[26] Patricia L. Wilson, “Whatever Happened to the WOLF?” linked from the *Army Materiel Command Logistics Support Activity Home Page*, http://www.almc.army.mil/ALOG/issues /MarApr01/MS643.htm, Internet; accessed 9 January 2008

[27] *Standard Army Maintenance System (SAMS) Home Page*, https://www.pmlis.lee.army.mil/tls/sams/sams.htm; Internet; accesses 9 January 2008.

[28] CW5 Robert Morrill, Aviation Material Manager, FORSCOM G4, telephone interview by author, 14 January 2008.

[29] U.S. Army Audit Agency, *Work Order Logistics File Accuracy and Use*, Audit Report A-2003-0256-AAM (Washington, D.C.: U.S. Army Audit Agency, 30 May 2003), 5.

[30] Ibid., 5.

[31] CW4 (Ret) Glenn Carthron, Headquarters Department of the Army, Assistant Secretary of the Army for Acquisition, Logistics, and Technology, Project Officer, ULLS-A(E) and Total Cost of Ownership, telephone interview by author, 10 January 2008.

[32] Ibid

[33] U.S. Department of the Army, *Sample Data Collection*, 1.

[34] Ibid.

[35] Major Warren O. Greene and Kevin B. Horsley, “Field Exercise Data Collection,” available from http://www.almc.army.mil/alog/issues/Mar-Apr98/MS255.htm; Internet; accessed 12 January 2008.

[36] Ibid.

[37] Ibid.

[38] Author's personal experience, Army G4, Aviation Readiness Team Chief, July 2006 to June 2007, Working on the Aviation MARC Task Force tasked to establish methods and procedure to improve the reliability of the MARC Data Base. The number of data collectors required per CAB was established by the group, but determined unaffordable.

[39] "Active-Duty Figures," available from http://seattlepi.nwsource.com/national/37341 _military01.shtml; Internet; accessed 18 February 2008.

[40] Isolde K Garcia-Perez, "Contractors on the Battlefield in the 21st Century*", Army Logistician Online* November / December 1999 [journal on-line]; available from http://www.almc.army.mil/ALOG/issues/NovDec99/MS454.htm, Internet; accessed 23 February 2008.

[41] Janet A. St. Laurent, *Force Structure — Need for Greater Transparency for the Army's Grow the Force Initiative Funding Plan* (Washington, D.C.: U.S. Government Accountability Office, 18 January 2008) available from https://www.us.army.mil/suite/doc/9895938; Internet; accessed 2 March 2008.

[42] MAJ Thomas W. Bamford, email message to author, 8 January 2008. MAJ Bamford was the Aviation Personnel System Staff Officer for the Deputy Chief of Staff G1, U.S. Army. This cost per active component soldier was derived by the Office of the Deputy Chief of Staff G1/MRA to provide an estimate for the cost of growing the Army and briefed the Army Senior Leadership.

[43] Ibid.

[44] Coleman.

[45] Rafael Enrique Valero, "Private military industry continues to grow," 9 January 2008, *Government Executive.com*, http://www.govexec.com/dailyfed/0108/010908nj1.htm; Internet; accessed 1 March 2008.

[46] Ibid.

[47] Ibid.

[48] "Confirmation Question And Answers For Patrick T. Henry From The Committee On Armed Services United States Senate," available from http://armed-services.senate.gov/ statemnt/ 980723ph.htm, Internet; accessed 21 January 2008.

[49] David S. C. Chu, *Overview of Recruiting, Retention, and Compensation*, Testimony before the House Armed Services Personnel Subcommittee (Washington, D.C.: 26 February 2008), available from http://armedservices.house.gov/pdfs/MilPers022608/ Chu_Testimony022608.pdf; Internet; accessed 1 March 2008.